

A Community-based Environmental Risk Assessment of Mercury Exposure by Seafood Consumption

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Why Community-Based Assessment?

Environmental (Human/Eco) Risk Assessment Activities

DOE 1994-1999 SRS, Hanford Site, & Complex-wide DQO for RA

OECD 1995-2000, 2002/2004

EPA SAB 2001-2006
EPEC 2005-2006 general review of EPA ERA methods
FIFRA SAP 2004
FIFRA ECOFRAM 1997-1999
Clean Air Act Lead SAC – 2006/2007

NAS NRC Review of OMB Risk Assessment Policy 2007

Private Consultation 20+ RA contracts 2000-2007

**Unsatisfactory integration of stakeholders and
slower-than-warranted acceptance by at-risk groups**

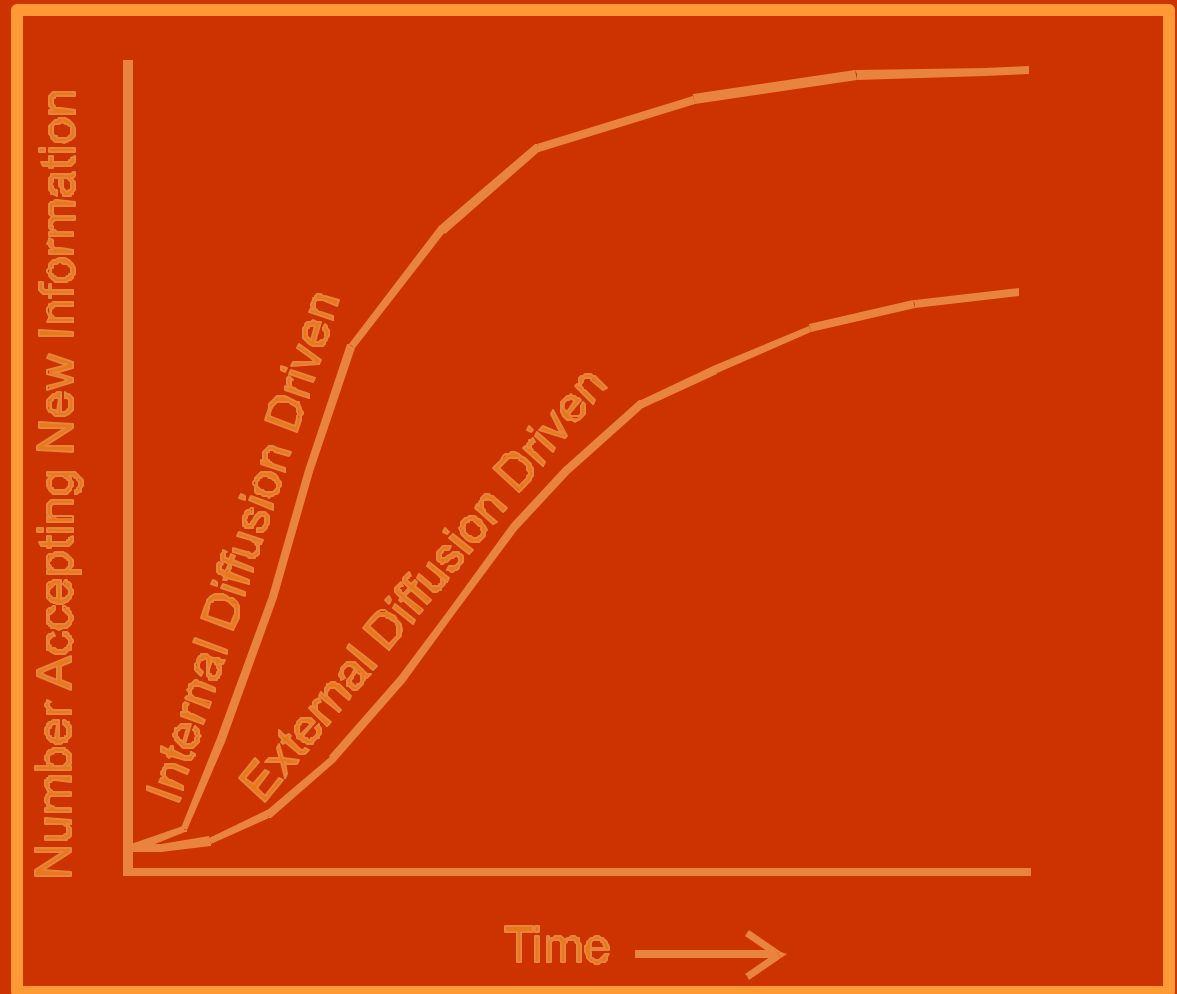
Community-Based Assessment

Positive Influence

- No Heterophilic Barriers
- Engage Opinion Leaders
- Use Existing Local Lines of Communication
- Frame in Local Context
- Make Compatible with Existing Local Ideas & Needs
- Can Adopt on Trial Basis

Fosters

- Ownership
- Trust
- Understanding
- Acceptance of Uncertainty
- Acceptance of Changes
- End User R/B Balancing



Diffusion Theory (Rogers. 1995. Diffusion of Innovations)

Gompertz diffusion curve (Mahajan & Peterson. 1985. Models for Innovation Diffusion).

Environmental Risk

Fin and shell fish are the main sources of mercury exposure to humans (EPA 2001).



Methylmercury:

- readily crosses the placental and blood/brain barriers.
- causes neurodevelopmental effects.
- low exposure can cause cardiovascular and immune system effects.

EPA's RfD of 0.1 ug/kg-day protects humans against chronic and developmental toxicity.

Who's at Risk?

December 2001, the National Environmental Justice Advisory Council (NEJAC) reported to EPA :



- issues of environmental justice, as it relates to fish consumption, exist for people of color, the poor, tribes, and other indigenous communities.

To date, minority specific assessments focused largely on Asians, Pacific Islanders, and Native Americans.

Who's at Risk?

Schober et al, 1999:

- Blood mercury levels increase with more frequent fish consumption
- Among women and children, blood mercury levels were higher in non-Hispanic Blacks than other racial groups

Burger et al, 1999:

- Blacks may be at greater risk of consuming contaminated fish

Mahaffey et al, 2000:

- Fin and shell fish consumption is highest among non-Hispanic black women.

McDowell et al, 2004:

- Non-Hispanic black and Mexican-American children had higher hair mercury levels than non-Hispanic white children

Who's at Risk?

Third National Report on Human Exposure to Environmental Chemicals (CDC, 2005):

Geometric mean of blood mercury concentrations (in $\mu\text{g/L}$) for females aged 16 to 49 years in the U.S. population, National Health and Nutrition Examination Survey, 1999-2002

Race/ethnicity

	Survey yrs	GM ((95% conf. interval)
Mexican Americans	99-00	.820 (.664-1.01)
	01-02	.667 (.541-.824)
Non-Hispanic blacks	99-00	1.35 (1.06-1.73)
	01-02	1.06 (.871-1.29)
Non-Hispanic whites	99-00	.944 (.726-1.23)
	01-02	.800 (.697-.919)

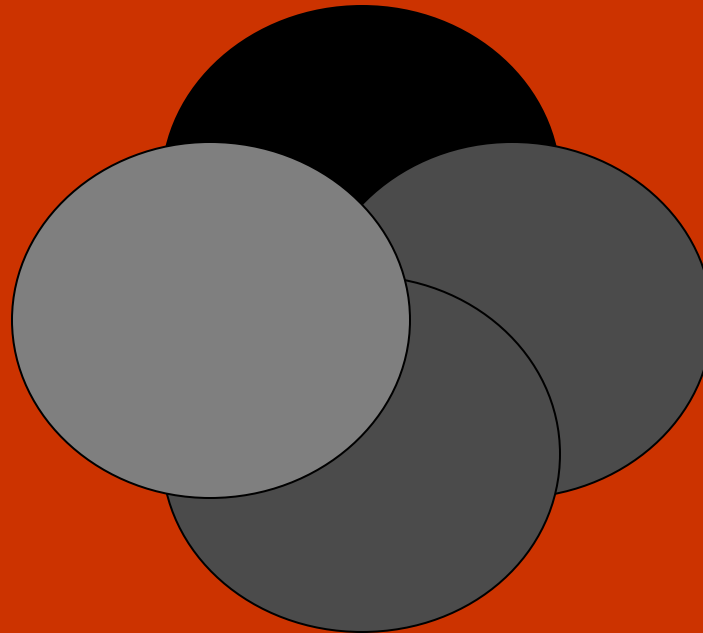
Current Research

RISK ASSESSMENT

Hazard identification

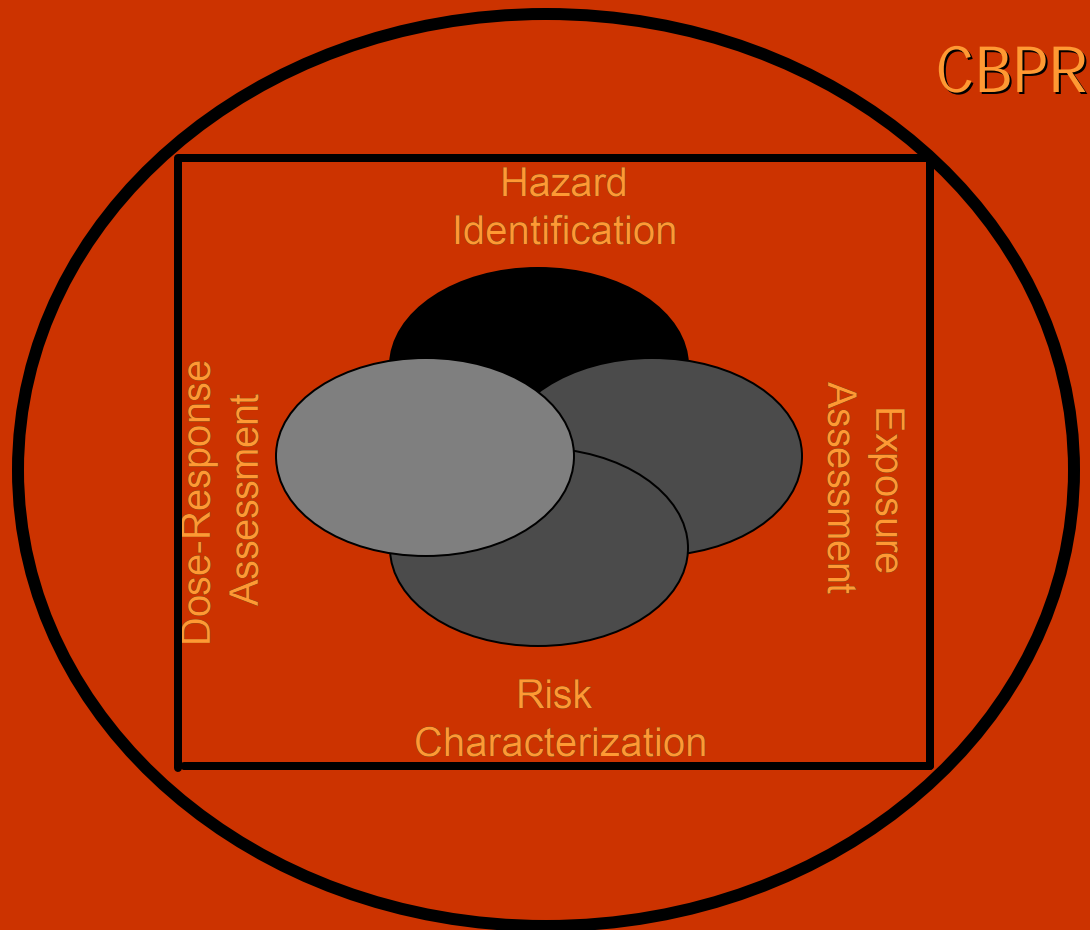
Dose-response
Assessment

Exposure
Assessment



Risk
Characterization

Current Research



Current Research

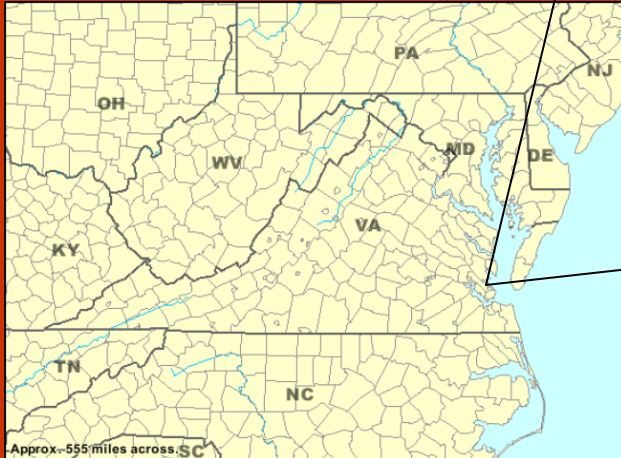
Community Based Participatory Research (CBPR):

- provides mechanism for community members to actively participate with researchers
- fosters an unique environment whereby cultural and lifestyle factors influencing exposure can be better understood
- more efficiently educates and empowers communities at-risk to accept and use risk information.

Current Research

This project focuses on:

- African American women (ages 13-49) in the East End community of Newport News, VA



- and the partnerships established with the Moton Community House and the Heal-Thy Generations: A Southeast Community Health Movement.

Current Research

Overarching Goal:

Atypical approach to enhance acceptance and use of risk information.

Specific Goal:

To generate scientifically-sound and socially-specific seafood exposure information to assess the environmental risk of mercury exposure in an African American community and to develop community-specific consumption limits aimed at reducing mercury exposure.

- verify seafood consumption rates of the East End community
- ascertain which seafood species are consumed
- determine mercury concentrations in these species
- probabilistically define mercury intake rates
- characterize all mercury health risks associated with seafood consumption

Current Research

$$\text{INTAKE (mg/kg-day)} = \frac{\text{CF} \cdot \text{IR} \cdot \text{EF} \cdot \text{ED}}{\text{BW} \cdot \text{AT}}$$

CF = chemical concentration in fish (mg/kg)

IR = ingestion rate (kg/meal)

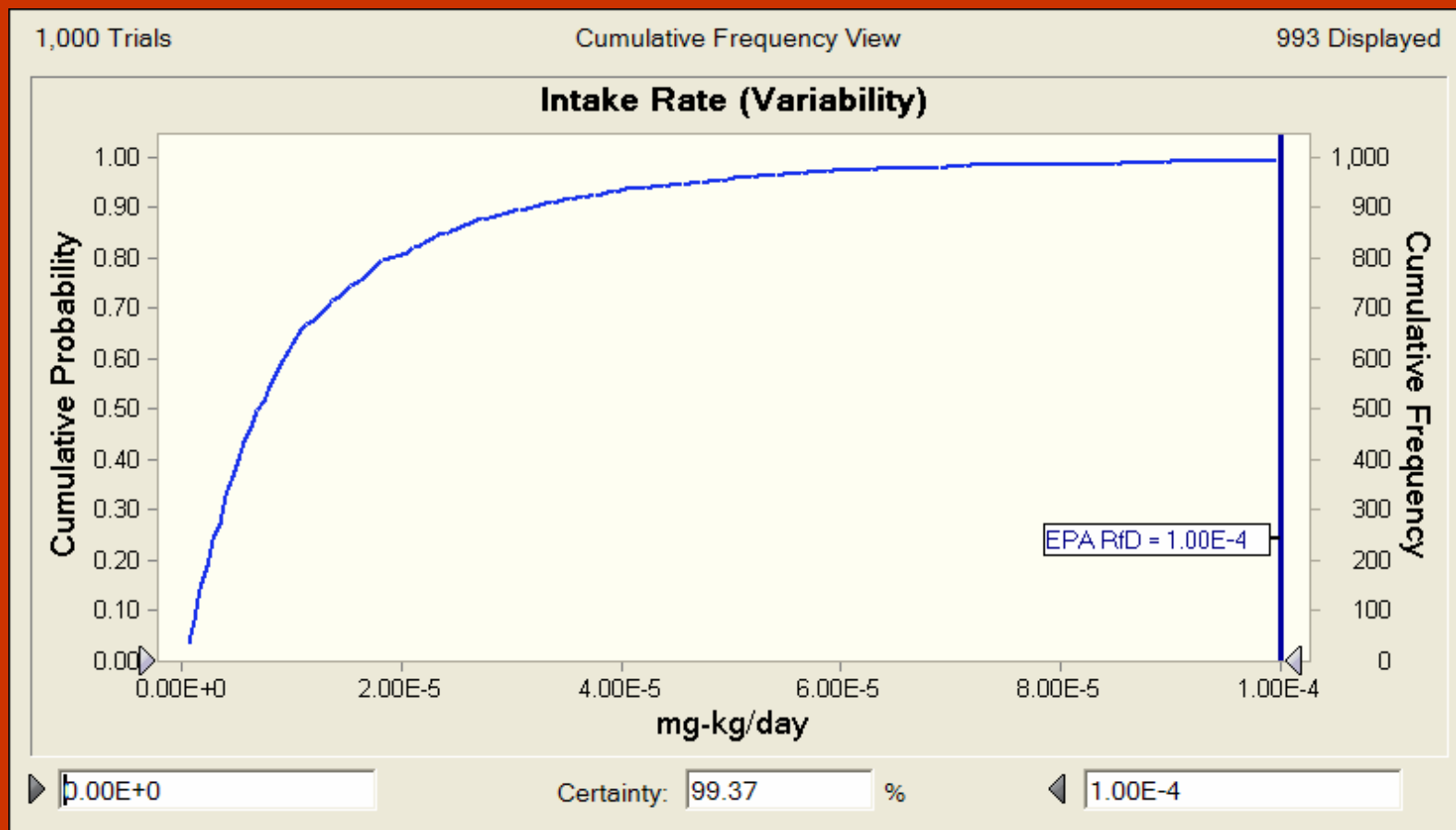
EF = exposure frequency (meals/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (period over which exposure is averaged-days)

Current Research



1 out of 100 women would exceed EPA's
Rfd for mercury (0.1 ug/kg-day)

Current Research

Future Actions Preliminary Assumptions

- Mercury concentrations will be determined in our lab for
- Species commonly consumed by target population (2001; Data such as standard deviation or standard error of AS and mercury concentrations (Which was not published by a DEQ) will be included in results and univariate statistics determined.
- Continuous IR data will be collected as opposed to
- Discrete Data was discrete but, a continuous distribution was assumed. For data with ranges, the
- Due to the nature of EE (number of meals/year), a discrete data will be collected however, it will be more fine-grained.
- Original IR data was discrete but, a continuous distribution
- The seafood consumption survey will be structured in a way that quantifies the amount of variation associated with variability in the population as well as the amount of variation associated with uncertainty in survey responses.

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